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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/552,936	BRAUNE ET AL.
	Examiner	Art Unit
	Fatima N. Farokhrooz	2879

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 October 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 October 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/11/05*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Objections

1. Claims 1,7, 6-9, 13 and 16 are objected to because of the following informalities:

a) In claim 6, the absorption is claimed as **low** and there is no mention of how low it should be. Hence it needs to be modified to a more definite low value.

b) In claim 7, in the portion of the claim "when a reflection measurement is carried out on a pressed powder tablet which consists of the .mu.m phosphor and which is optically dense, that is to say has an angle-integrated transmission of <;5%", "when" is an equivalent of "if" ,hence it is not a necessary limitation as it does not account, for instance , when a reflection measurement is not carried out. Also in claims 1 and 7 the particle size in **the range of 1 to 50nm,preferably** 2 to 25 nm (claim 1) and size d50 greater than 1 mu.m,in **particular < or equal to 20mu.m, preferably <or equal to 10 mu.m** is objected to as it is a broad claim followed by narrower version of the broad claim portion. Hence appropriate corrections are needed.

c) In claim 8, the descriptive points A50,FW50,FW70 and FW90 are objected to as they are not usually known phrases used and applied by one of ordinary skill in the art. Also the terms preferably,particularly preferably and extremely preferably is objected to,as it is not clear which one of the three terms is being claimed.

d) In claim 9, the portion of the claim " wherein a nanophosphor with an activator is used,chosen such that **the concentration of the activator** is low, to be precise (narrow claim followed by broader version of the claim) reaches at most 75%, preferably 10 to 50%, **of the concentration of the activator** in the case of the identical .mu.m phosphor is incorrect claim language. Modifications are needed with a more clear claim language.

e) In claim 13, the term A in the phrase "in the proportion of D being at most 0.9 mol % of **A**", is not clear. If A refers to garnet **A3B5012, A** needs to be corrected as A3B5012.

f) In claim 16, the **use of nanophosphors** does not carry patentable weight. It is the product and not the use of the product that may be claimed. Also the claim has a broad (long wave radiation) followed by a narrower version of the claim **(in particular** into visible radiation in the range of 430 -750 nm). For purposes of art rejection, it is deemed that the nanophosphors is claimed as a conversion means.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1,2,3,4, 14,15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Klaus Hohn et al (US 6066861) in view of Haubold et al (US PG pub. 20030032192)

Regarding Claim 1, Hohn teaches a Luminescence-conversion LED (Fig.3), an LED chip emitting primary radiation with a peak wavelength in the range of 300 to 470 nm (col.5,lines 61-67 wherein ultraviolet and blue are in the 300-470 range, (col.5,lines 30-39), this radiation being converted partly or completely into secondary longer-wave radiation (col.4,lines 47-54, col.3, lines 41-47) by photoluminescence by at least one phosphor (lines 22-29 of col.4) which is exposed to the primary radiation of the LED.

Claim 1 does not teach that the conversion is achieved at least with the assistance of a phosphor of a mean particle size d50 that lies in the range of 1 to 50 nm, preferably 2 to 25 nm, which is referred to hereafter as a nanophosphor.

In the same field of endeavor, Haubold teaches a phosphor of a mean particle size of 1-50 nm ([0004],[0130],[0133]) that is capable of fluorescence ([0001], [0150]),the nanophosphor is used in order to achieve intense luminescent emission that is environmentally insensitive.

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to add the nanophosphor , as disclosed by Haubold, in the Luminescence-conversion LED of Hohn in order to achieve intense luminescent emission that is environmentally insensitive.

3. Regarding claim 2, Hohn teaches a LED, wherein the phosphor is dispersed in an encapsulating compound which is exposed to the primary radiation, the encapsulating compound consisting of insulating material (col.4,lines 4-13,wherein epoxy casting resin in col.3,lines 3-11 and lines 54-67).

4. Regarding claim 3, Hohn teaches a LED, wherein a blue emitting primary radiation of a peak wavelength of 420 to 470 nm is used (col.5,lines 61-67), together with a secondary yellow emitting phosphor (col.3,lines 41-47).

5. Regarding claim 4, Hohn teaches a LED, wherein a UV emitting primary radiation of a peak wavelength of 330 to 410 nm is used (col.2,lines 8-12,wherein ultraviolet and blue cover the 330-410 range), together with three secondary red,green and blue emitting phosphors (col.4, lines 47-54; col.5, lines 62-65).

6. Regarding claims 14 and 15, here the Applicant is claiming the product of an LED with nanophosphors including methods (i.e. a process) of applying the phosphor to the chip , consequently, claims 14 and 15 are considered "product-by-process" claims. In spite of the fact that a product-by-process claim may recite only process limitations, it is the product and not the recited process that is covered by the claim. Further, patentability of a claim to a product does not rest merely on the difference in the method by which the product is made. Rather, is the product itself which must be new and not obvious (see MPEP 2113).

7. Regarding claim 16, Hohn teaches a phosphor as a conversion means in optical semiconductor devices of the LUCOLED type for the conversion of short-wave primary emitting radiation between 300 and 470 nm (col.5,lines 60-67) into longer-wave radiation, in particular into visible (col.5,lines15-19 and 31-39; col.6,lines 11-17; col.6,lines 53-55 and claim 1) radiation in the range of 430 to 750 nm (col.9,lines 36-52). Hohn does not teach nanophosphors with a mean particle size of 1 to 50 nm .The added Haubbold reference teaches nanophosphors with a mean particle size of 1 to 50 nm ([0133], [0004]) in order to achieve intense luminescent emission that is environmentally insensitive.

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to use the nanophosphor , as disclosed by Haubold, in the Luminescence-conversion LED of Hohn in order to achieve intense luminescent emission that is environmentally insensitive.

8. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Klaus Hohn et al (US 6066861) in view of Haubold et al (US PG pub. 20030032192) as applied to claims 1 and 4 above, further in view of Fink (US PG pub. 20030057821).

Regarding claim 5, the above combination teaches the invention set forth above (see rejections in claims 1 and 4). The above combination does not disclose an LED, wherein the following phosphor system is used: for red: Y2O2S:Eu; and for green: ZnS: Cu,Al or ZnS:Cu,Mn or ZnS:Cu; and for blue SCAP or ZnS:Ag.

In the same field of endeavor of display devices, the added Fink reference teaches a light emitting device wherein the following phosphor system is used: for red: Y2O2S:Eu; and for green: ZnS: Cu,Al; and for blue ZnS:Ag. ([0005], lines 1-5) in order to make them vacuum compatible for many applications ([0004]).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to use the phosphor system as disclosed by Fink, in the LED of the previous combination in order to in order to make them vacuum compatible for many applications.

9. Claims 6 ,8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Klaus Hohn et al (US 6066861) in view of Haubold et al (US PG pub. 20030032192) further in view of Bhargava et al (US 6241819).

Regarding claim 6, the above combination teaches the invention set forth above (see rejection in claim 1). The above combination does not teach an LED wherein the phosphor is chosen such that it has only low absorption in the range of the peak wavelength of the primary radiation and is in particular a phosphor that is made to luminesce by an activator.

The added Bhargava reference teaches a phosphor such that it has only low absorption (absorption values >300 nm in Fig.2, col.4, lines 5-21) in the range of the peak wavelength (300-470 nm in claim 1) of the primary radiation and is in particular a phosphor that is made to luminesce by an activator (col.1,lines 10-24) in order to achieve optimal wavelength conversion.

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to use the phosphor as disclosed by Bhargava, in the LED of the previous combination in order to achieve optimal wavelength conversion.

Regarding claim 8, the above combination teaches the invention set forth above (see rejections in claims 1 and 6).

Further, the Bhargava reference teaches a phosphor wherein the long-wave absorption edge (300 -400 nm in Fig.2 ,col.4, lines 5-21) of the Nanophosphor lies under the long-wave edge of the primary emission (300-470 nm as disclosed by Hohn in claim 1).

10. Regarding claim 10, Hohn and Haubold teach the invention set forth above (see rejections in claim 1). However the combination does not teach the LED that comprises of CdSe.

In the same field of endeavor, Bhargava teaches a single phosphor comprising semiconducting nanoparticles, in particular CdSe (col.4,lines 40-44) in order to achieve greater photoluminescent quantum yield.

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to use the CdSe as disclosed by Bhargava, in the LED of the previous combination in order to to achieve greater photoluminescent quantum yield.

11. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Klaus Hohn et al (US 6066861) in view of Haubold et al (US PG pub. 20030032192) and Bhargava et al (US 6241819),further in view of Konrad (US 6391273).

The portion of the claim "**when a reflection measurement is carried**" is a method claim and hence has no patentable weight for a product claim. Hence Examiner suggests modification of the claim.

Regarding clàim 7, the above combination teaches the invention set forth above (see rejections in claims 1 and 6). Further Hohn teaches a LED wherein a nano phosphor is coarser-grained phosphor with mean particle size of less than 20 mu.m (col.2, lines 20-21).

However, the previous combination does not teach that the phosphor exhibits at the peak wavelength of the LED chip a reflection of greater than 50%. The added Konrad reference teaches in Fig.4a (In Fig. 4a the reflection is greater than 0.5 at wavelength of 300 nm which is the peak wavelength of the LED; col.5,lines 38-47,col.3,lines 64-67) that the phosphor exhibits at the peak wavelength of the LED chip a reflection of greater than 50% in order to achieve optimal wavelength conversion.

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to use the phosphor as disclosed by Konrad, in the LED of the previous combination in order to achieve optimal wavelength conversion.

12. Claims 9 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Klaus Hohn et al (US 6066861) in view of Haubold et al (US PG pub. 20030032192) and Konrad (US 6391273),further in view of Cheetam et al (US PG pub 20050077499).

Claims 9 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Klaus Hohn et al (US 6066861) in view of Haubold et al (US PG pub. 20030032192) and Konrad (US 6391273),further in view of Bhargava et al (US 7175778).

Regarding claim 9, the above combination teaches the invention set forth above (see rejections in claims 1, 6 and 7). The said combination does not teach an LED wherein a nanophosphor with an activator is chosen such that the concentration of the **activator is low, to be precise reaches at most 75%, (preferably 10 to 50%),** of the concentration of the activator in the case of the identical .mu.m phosphor, so that the given activator concentration of the .mu.m phosphor is higher and serves as a reference corresponding to 100%, the .mu.m **phosphor being chosen such that it has high absorption** in the range of the peak wavelength of the primary radiation, preferably more than 50%, in particular more than 70%, but an identical phosphor with **low concentration of the activator has low absorption** in the range of the peak wavelength of the primary radiation, preferably at most 30%, in particular at most 20%.

The added Bhargava reference teaches that the **light generated** in the nanocrystals was associated with the **activator (dopant)** while the **absorption** was assoicated with the host (col.1,lines 30-36).

Hence , with respect to the specific concentrations of the activator and the absorption regions: Prior Art has disclosed the LED dependencies on the light generated and on the activator. The specific activator concentrations and the absorption claimed by applicant, absent any criticality, is only considered to be the

"optimum" values based on the theory disclosed by the Prior Art that a person having ordinary skill in the art would have been able to determine using routine experimentation based, among other things, on the desired accuracy, manufacturing costs, etc. (see In re Boesch, 205 USPQ 215 (CCPA 1980)), and since neither non-obvious nor unexpected results, i.e., results which are different in kind and not in degree from the results of the prior art, will be obtained as long as various activator concentration values are experimented as suggested by the Prior Art. In this case, varying the activator concentration will be obvious for one having ordinary skill in the art who want to modify the absorption depending on the peak wavelength of the primary radiation.

14. Regarding claim 13, Hohn teaches a LED wherein the phosphor is a garnet which is doped with a rare earth element D, (col.4, lines 23-29). Hohn does not teach the proportion of D being at most 0.9 mol % of A and that the nanophosphor is a garnet of type A3B5012.

The added Haubold reference teaches that garnet nanophosphors ([0191]-[0194]) are doped with rare earth elements (terbium in claim 25) with a mol percent of 0.5 to 30 % (claim 25). Haubold does not teach that the proportion is **at most** 0.9%.

Hence, regarding the mol percent of the rare earth elements ,Haubold discloses a mol percent of 0.5 to 30% but does not disclose a particular maximum value for this mol percent parameter. However, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to provide a mol % of at most 0.9% of the garnet, since it has been held that where the general conditions of a claim

are disclosed in the prior art, discovering the "optimum range" involves only routine skill in the art. ***In re Aller***, 105 USPQ 233.

With respect to the garnet being of type A3B5012 : Hohn discloses a garnet. The use of the particular type of garnet that is A3B5012 claimed by the applicant, absent any criticality, is considered to be nothing more than a choice of engineering skill, choice or design because neither non-obvious nor unexpected results, i.e., results which are different in kind and not in degree from the results of the prior art, will be obtained as long as garnet is used, as already suggested by Hohn, and the use of the particular type of garnet by Applicant is considered to be nothing more than the use of one of numerous and well known alternate types of garnet that a person having ordinary skill in the art would have been able to provide using routine experimentation in order to use a garnet nanosphere in a LED as already suggested by Hohn.

15. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Klaus Hohn et al (US 6066861) in view of Haubold et al (US PG pub. 20030032192) and Konrad (US 6391273),further in view of Cheetam et al (US PG pub 20050077499).

Regarding claim 9, the above combination teaches the invention set forth above (see rejections in claims 1, 6 and 7). The said combination does not teach an LED wherein a nanophosphor with an activator is chosen such that the concentration of the **activator is low, to be precise reaches at most 75%, (preferably 10 to 50%)**, of the concentration of the activator in the case of the identical .mu.m phosphor, so that the

given activator concentration of the .mu.m phosphor is higher and serves as a reference corresponding to 100%, the .mu.m **phosphor being chosen such that it has high absorption** in the range of the peak wavelength of the primary radiation, preferably more than 50%, in particular more than 70%, but an identical phosphor with **low concentration of the activator has low absorption** in the range of the peak wavelength of the primary radiation, preferably at most 30%, in particular at most 20%.

The added Cheetam reference teaches that the charge transfer band and the band edge shift to longer wavelengths with increasing bismuth (ACTIVATOR) concentration ([0029] and col. 14-16 in [0029]).

Hence , with respect to the specific concentrations of the activator and the shift in the excitation spectra: Prior Art has disclosed the LED spectra dependencies on the activator concentration . The specific activator concentrations and the absorption level claimed by applicant, absent any criticality, is only considered to be the "optimum" values based on the theory disclosed by the Prior Art that a person having ordinary skill in the art would have been able to determine using routine experimentation based, among other things, on the desired accuracy, manufacturing costs, etc. (see In re Boesch, 205 USPQ 215 (CCPA 1980)), and since neither non-obvious nor unexpected results, i.e., results which are different in kind and not in degree from the results of the prior art, will be obtained as long as various activator concentration values are experimented as suggested by the Prior Art. In this case, varying the activator concentration will be obvious for one having ordinary skill in the art who want to modify the spectrum depending on the peak wavelength of the primary radiation.

16. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Klaus Hohn et al (US 6066861) in view of Haubold et al (US PG pub. 20030032192), further in view of Burroughes (US PG pub. 20030076454).

Regarding claim 11, Hohn teaches a LED with electrically conductive terminals. Hohn does not teach that the chip can be connected to a voltage source via electrically conductive terminals.

In the same field of endeavor, Burroughes implicitly teaches a light emitting device (Fig.1) wherein the chip is connected to a voltage source ([0030],[0033]; Table 1,Table 2) via electrically conductive terminals for the benefit of operating the device at low voltage,so that lower power is consumed.

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to use a voltage source as disclosed by Burroughes, in the LED of Hohn for the benefit of operating the device at lower voltage, ,so that lower power is consumed.

17. Regarding claim 12, Burroughes teaches a light emitting device connected to a voltage source wherein the voltage source provides a voltage of at most 5 V ([0030],[0033]).

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fatima Farokhrooz whose telephone number is (571)-

272-6043. The examiner can normally be reached on Monday- Friday, 9 am - 5 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (571) 272-2457. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

FF

Fatima Farokhrooz Examiner

Karabi Guharay Primary Examiner